Comparing theories' performance in predicting violence

Haas, Henriette ; Cusson, Maurice

Abstract: The stakes of choosing the best theory as a basis for violence prevention and offender rehabilitation are high. However, no single theory of violence has ever been universally accepted by a majority of established researchers. Psychiatry, psychology and sociology are each subdivided into different schools relying upon different premises. All theories can produce empirical evidence for their validity, some of them stating the opposite of each other. Calculating different models with multivariate logistic regression on a dataset of N = 21,312 observations and ninety-two influences allowed a direct comparison of the performance of operationalizations of some of the most important schools. The psychopathology model ranked as the best model in terms of predicting violence right after the comprehensive interdisciplinary model. Next came the rational choice and lifestyle model and third the differential association and learning theory model. Othermodels namely the control theory model, the childhood-traumamodel and the social conflict and reaction model turned out to have low sensitivities for predicting violence. Nevertheless, all models produced acceptable results in predictions of a non-violent outcome.

DOI: https://doi.org/10.1016/j.ijlp.2015.01.010

International Journal of Law and Psychiatry xxx (2015) xxx–xxx

Contents lists available at ScienceDirect

International Journal of Law and Psychiatry

Comparing theories' performance in predicting violence

Henriette Haas [a,*], Maurice Cusson [b]

[a] Departement of Psychology, University of Zürich, Switzerland
[b] Ecole de criminology, Université de Montréal, Canada

ARTICLE INFO

Available online xxxx

Keywords:
Theories
Performance
Violence
Prediction
Cross-sectional study
Psychopathology

ABSTRACT

The stakes of choosing the best theory as a basis for violence prevention and offender rehabilitation are high. However, no single theory of violence has ever been universally accepted by a majority of established researchers. Psychiatry, psychology and sociology are each subdivided into different schools relying upon different premises. All theories can produce empirical evidence for their validity, some of them stating the opposite of each other. Calculating different models with multivariate logistic regression on a dataset of **N** = 21,312 observations and ninety-two influences allowed a direct comparison of the performance of operationalizations of some of the most important schools. The psychopathology model ranked as the best model in terms of predicting violence right after the comprehensive interdisciplinary model. Next came the rational choice and lifestyle model and third the differential association and learning theory model. Other models namely the control theory model, the childhood-trauma model and the social conflict and reaction model turned out to have low sensitivities for predicting violence. Nevertheless, all models produced acceptable results in predictions of a non-violent outcome.

1. Scientific controversies about the roots of violence

In 2005 Kroner, Mills, and Reddon published a study comparing the predictive accuracy of four well-known criminal risk assessment scales (PCL-R, LSI-R, VRAG, GSIR) to four randomly generated scales (so-called coffee-can scales), each one consisting of 13 items taken blindly from the pool of all items of the original scales. Their results showed that the original instruments did not perform better than the coffee-can scales, thus demonstrating a deficiency of conceptual bases of those risk assessments scales. The authors proposed that more specific prediction scales should be created, theory driven and outcome specific as well, so that treatments can be directed at reducing specific risks and their effects measured.

With the present study we intend to pursue the inverse approach, testing the predictive qualities of different theories about violence by logistic modeling and comparing those theory-driven models with the comprehensive theory-unspecific violence prediction model derived from the entire pool of ninety-two variables related to risk and protective factors.

Almost every school in psychiatry, psychology and sociology has developed its own theory about the origins of violence. But which ones among them allow causal inferences? Which influences are mediators, which variables are influenced by unidentified backdoor-paths and which ones are only confounding covariates? All empirical findings suggest that there is no uniform behavior pattern or simple cause of the phenomenon of violence. This study addresses the issue and suggests a method to assess different theories on violence in an epidemiological perspective.

One branch of sociology claims that macro-social influences precede individual traits and the influence of the primary care group (i.e. the family). Psychology and psychiatry assert the opposite. Control theory, arguing that delinquency is the product of a failure of personal and social controls, constructs a bridge between the two. To examine their performance we compared the following theories to a comprehensive interdisciplinary model:

- social conflict and reaction theories
- differential association and learning theories
- rational choice and lifestyle theories
- control theory
- childhood trauma theories
- psychopathology

To avoid blurring all boundaries between different theories we chose to operationalize them with factors related to their core-hypothesis only.

2. Defining violence

The initial characterization of a phenomenon will closely influence all empirical results that might be found thereafter. The hazier the

* Corresponding author at: Psychologisches Institut, Universität Zürich, Binzmühlestr 1 Box 1, CH-8050 Zürich, Switzerland. Tel.: +41 79 226 06 61.
E-mail address: henriette.haas@psychologie.uzh.ch (H. Haas).

http://dx.doi.org/10.1016/j.ijlp.2015.01.010

criterion, the more confusing and rambling all explications concerning a social phenomenon must become. For the present purpose, violence was defined as "the physical attack against another person, as well as the threat to perpetrate such an attack" (Swiss National Science Foundation, 1995, p. 5). We made sure to grasp many kinds of physical attacks or threats of a physical attack with the questionnaire (Haas, 1997; Killias, 1997). Keeping in mind the goal of explaining only one specific phenomenon (i.e. intentional physical violence) we did not include sexual abuse in this definition, nor reckless driving, nor verbal abuse.

3. Data and variables of the 1997 Swiss youth and army recruits survey *ch-x*

3.1. Data collection and the validity of the data

Swiss Army recruits are interviewed regularly on a topic of social, health or policy relevance. This study, based on a sample of 21,312 valid interviews with 20-year-old Swiss males, was collected in 1997 and represents over 70% of the national cohort. Questionnaires lacking credibility have been excluded from the database. After approximately four weeks of basic training, the soldiers were asked to complete a 44-page questionnaire containing about 900 items. The questionnaire was conceived in an interdisciplinary approach by a sociologist (Killias, 1997) and a psychologist (Haas, 1997). The topic chosen in 1997 was acts of physical violence committed by the recruits before their training in the army.

The data collection took place in the first weeks of the recruits' training. Between 35 and 60 soldiers sat in a classroom, with space between them (exam-like), under the remote supervision of civilian staff. They were to put their completed anonymous questionnaires into a box with a slit. This procedure established confidentiality comparable to an electoral ballot and very few soldiers refused to co-operate. All recruits were obliged to attend the whole session, but the questionnaire explicitly allowed to leave any questions unanswered. Men of the same age group who did not serve in the army in 1997 were invited to answer a short version of the questionnaire by mail. This sample of 1160 non-recruits showed a bimodal distribution, with a disproportionate number of university students. Illegal drug use and sexual harassment were admitted somewhat more often by those not enrolled in the army, whereas physical violence and forced sexual intercourse were admitted more by army recruits. However, the difference was not large (Haas, 2001).

3.2. The items of the questionnaire

At the beginning of the questionnaire a wide range of questions concerned the biographic and social circumstances of their childhood, adolescence and young adulthood (Haas, 1997; Killias, 1997). Next came lists of questions about offenses that the recruits could have committed in the twelve months before training. Finally there was a set of questions concerning their social life as young adults as well as descriptions of themselves and opinions on law and on violence.

3.3. The criterion variable, operationalization of violence

Covering the twelve months before the recruits' training, the questionnaire contained a list of 13 different types of violence to be scored on a frequency range from 0 to 20 times (and more). It was followed by a series of questions about the severity of the acts, the identity of the victims and the potential disclosure of the offenses, according to the suggestions made by Hindelang, Hirschi, and Weis (1981). The criterion variable violent behavior (over the past twelve months before training) thus includes a variety of acts of physical violence ranging from beating, kicking, threatening with weapons, using blunt objects as weapons, poisoning, throwing stones, to shooting with a firearm at somebody. Among all 21,312 recruits, $n = 528$ had not answered any question related to acts of violence, $n = 15{,}622$ had not committed any acts of violence, whereas $n = 5162$ (24.22% of those who had answered) had committed acts of physical violence. Compared to previous publications (with $N = 21{,}314$ observations) we chose a new and better interpretation of the raw data set, excluding two more records).

The factors to be tested were chosen among ninety-two entering variables, known as criminogenic or protective factors, almost all of which had a significant bivariate effect on violence. Some factors on the list are composite variables or scales with several levels (see Haas, 2001).

Some variables serve to test several related theories as they fit equally well the constructs of all these theories. The data were analyzed with proc freq, proc corr, proc means, proc logistic, proc mi, and proc mianalyze from the SAS® software.

4. Testing theories' performance

Many studies support their hypotheses with the simple existence of a statistical link between a risk factor (typically unemployment and childhood trauma) and the outcome violence. Often brought up as evidence, many such links are only confounding covariates. Closer to the goal of causal inference, one can build multivariate models, taking into account the influence of several different variables, each assuming a distinct role in the genesis of the phenomenon. In the last decades, the multivariate logistic regression has become the method of choice for doing so. We used it to test the prediction power of the model containing only the relevant influences for the respective theory.

As many violent offenders act rather impulsively in any context lacking close supervision, this symptom manifested itself also in the way they filled out their questionnaires. Unfortunately the regression algorithm excludes all observations with missing values in the entering variables. So when a large number of influences are tested, more than fifty percent of a sample will be excluded. Imputing missing values was here the best solution to avoid sampling bias (Lessler & Kalsbeek, 1992). The following models were constructed with imputed values for missing values in the entering variables by the statistical means corresponding to the respective level of violence and then compared to the models without imputation and to ten models created by random-multi-imputation of the missings.

To test a model for a given theory, we must first determine the performance of the null hypothesis, stating that violence cannot be predicted—and thus not prevented—at all. This hypothesis is true in majority of cases (the three out of four non-violent individuals among all males), but it fails totally when it should predict violent cases. These are the parameters of the null hypothesis (Table 1):

Any theory claiming to take the credit for a valid explanation for the phenomenon of violence must perform above the prediction parameters of the null hypothesis.

5. The model for social conflict and reaction theories

Since the 19th century, sociologists and economists have observed the overrepresentation of the underprivileged in criminal statistics. Marx (1867) argued that the capitalist system's emphasis on

Table 1
The null hypothesis (no factors entered).

Classification parameters	Proportion of cases
Correct predictions	75.78%
True hits (sensitivity)	0.00%
True rejections (specificity)	100.00%
False alarms (false positives)	0.00%
False rejections (false negatives)	24.22%

Note: Prediction based on the assumption that no factors influence the outcome.

Please cite this article as: Haas, H., & Cusson, M., Comparing theories' performance in predicting violence, *International Journal of Law and Psychiatry* (2015), http://dx.doi.org/10.1016/j.ijlp.2015.01.010

competition and wealth produces a society in which crime, as a sign for an alienated life under unjust working conditions, is inevitable. Delinquency was seen as a resistance against the capitalist system by the underprivileged (e.g. Quinney, 1977). Merton (1938) took into account the empirical finding of sociological surveys that the lower classes—more often than being carried by a revolutionary spirit—share the upper classes' values. According to him, delinquency is an innovation of lower class members who recur to illegal means because they are at a loss for legal means to achieve social success.

Social reaction theories maintain that people are not born deviant, whatever their mental or physical characteristics are. Authorities scapegoat those who are defined as different, and especially the powerless. For authors like Becker (1963) or Lemert (1967) social control will not reduce but amplify the deviance of those to whom it is applied.

The model in Table 2 includes variables measuring social disadvantage and social reaction to deviant behavior.

This model did very poorly when it came to spotting violent cases, but it predicted the non-violent cases better than any other model. The most strongly associated variables with future violence were juvenile records at different ages. However, not knowing the cause of the indictment, we cannot know whether light or severe offending lead the corresponding court record. Despite its small hit rate, this model scored high in false alarms, thus labeling nearly forty percent of innocents as potentially violent. Therefore the empirical predictions based upon the above-mentioned variables behaved contrary to the theory's own affirmations. If they existed, negative side effects of repression and specialized institutions should also be observed by the placement of juvenile delinquents in an institution for young delinquents (the harshest sanction), as well as by an early stigmatization and exclusion, prior to secondary deviance, consisting in special schooling at age six to eleven. However both factors were not retained as risks. The model did retain some of the variables of social disadvantage, except another of the most central influences - if this theory was to be believed: parents' dependence on welfare. Considering the well-equipped Swiss welfare system the sole fact of being underprivileged does not seem to produce violence. We might also draw some conclusions from Merton's (1968) functional approach of the major influence of social resources on the individual's capacity to achieve culturally defined goals. The social resources approach can be partially substantiated. Disposing of a good educational background seems to protect against the acting out of physical violence, but the lack of it does not seem to incite it.

6. The model for differential association and learning theories

It is well known that delinquents tend to associate with each other. Many incidents happen within a subculture, such as street gangs, the drug scene, or hooligans. Sutherland pointed out that criminal behavior could be learned in interaction processes and values transmitted within intimate groups. Sutherland and Cressey (1955, p. 78) wrote "A person becomes delinquent because of an excess of definitions favorable to violation of law over definitions unfavorable to violation of the law". Sellin (1938) also falls in this category of explanations, as well as the gender approach. More recently Akers (1985, 1994) has renewed this approach with adding the differential reinforcement hypothesis. Adolescents are first seduced into delinquent behavior by associating with deviant peers. In a second process, through differential reinforcement, they are conditioned how to reap rewards and avoid punishment by reference to the actual or anticipated consequences of given behaviors.

If these hypotheses were confirmed we would expect the number of delinquent friends, frequentation of many groups or events, and also watching illegal hard core and pornographic videos to have a significant influence on violence, outweighing early childhood experiences or personality traits.

The differential association model (Table 3) composed of only seven relevant variables is very parsimonious. For interval-scaled variables, some of the respective odds ratios have to be raised to the power of the frequency. For instance the odds ratio for somebody with seven or more delinquent friends is $OR = 1.339^7 = 7.7$, or the odds ratio for somebody who watched sixty times hardcore videos is $OR = 1.052^{60} = 20.9$. Regular attendance in a club or association at young adult age and being popular in grade school had no influence. As to

Table 2
Social conflict and reaction theories (17 variables entered, 10 models with multi-imputation).

	OR	*OR*	*OR LCL–UCL*
Variables	Imp. means	No Imp.	Multi-Imp.
Parents depended on welfare	1.139	x	0.958–1.280
Parents' immigration from regions in crisis and from cultures promoting machismo	1.082	1.130	1.012–1.164
Father's level of educational achievement	0.959	x	0.932–0.991
Mother's level of educational achievement	x	x	0.950–1.017
Moved to a bigger city after adolescence	1.108	x	0.995–1.219
Repeated a year in grade school (poor achievements)	1.200	x	1.002–1.337
Special grade school for learning/behavior problems	x	x	0.946–1.404
Lived in institution for delinquent/neglected children	x	x	0.841–1.866
Police record for any offense during childhood	1.506	1.322	1.041–1.397
Court record for any offense during childhood	x	x	0.608–1.317
Repeated a year in high school (poor achievements)	1.228	x	0.996–1.306
Special high-school for learning/behavior problems	1.186	x	0.906–1.358
Lived in institution for delinquent/neglected adolescents	x	x	0.772–1.446
Police record for any offense during adolescence	1.737	1.645	1.337–1.597
Court record for any offense during adolescence	1.661	1.610	1.202–1.534
Level of educational achievement of the recruit	0.903	x	0.877–0.927
Unemployment (year before recruits' training)	1.395	1.543	1.167–1.594
Classification parameters/prob. level .5	Imp. means	No Imp.	Multi-Imp.
Correct predictions	76.3%	76.3%	76.1–76.2%
True hits (sensitivity)	6.8%	5.2%	4.3–4.7%
True rejections (specificity)	98.6%	99.0%	99.0–99.1%
False alarms (false positives)	39.7%	36.5%	38.2–40.2%
False rejections (false negatives)	23.2%	23.4%	23.5–23.6%

Legend: x = removed by the algorithm.
Imputation by means and multi-imputation: $N = 21{,}312$ (violent: 5162), missing: 528.
No imputation: $N = 11{,}164$ (violent: 2668), deleted because of missing values: 10,148.

Please cite this article as: Haas, H., & Cusson, M., Comparing theories' performance in predicting violence, *International Journal of Law and Psychiatry* (2015), http://dx.doi.org/10.1016/j.ijlp.2015.01.010

Table 3
Differential association and learning theories (9 variables entered, 10 models with multi-imputation).

	OR	*OR*	*OR LCL–UCL*
Variables	Imp. means	No Imp.	Multi-Imp.
Good relationships with classmates in grade school	x	x	0.910–1.019
Good relationships with classmates in high-school	0.891	0.912	0.853–0.948
Number of persons considered as friends	1.016	1.025	1.000–1.031
Having already had a steady girlfriend (partner)	1.462	1.424	1.310–1.515
Took actively part in a club, association, society	x	x	0.952–1.032
Believes in life after death	1.062	1.060	1.001–1.064
Episodes of watching illegal hard core & porn videos	1.052	1.046	1.040–1.052
Number of friends in trouble with the police	1.339	1.288	1.243–1.296
Associated with groups and gangs known to use violence (violent extremists, hooligans, drug scene)	1.352	1.449	1.304–1.436
Classification parameters/prob. level .5	Imp. means	No Imp.	Multi-Imp.
Correct predictions	77.0%	76.9%	76.9–77.0%
True hits (sensitivity)	15.8%	13.9%	14.0–14.4%
True rejections (specificity)	96.6%	97.1%	96.9–97.0%
False alarms (false positives)	40.4%	39.5%	39.6–40.5%
False rejections (false negatives)	21.8%	22.1%	22.0–22.1%

Legend: x = removed by the algorithm.
Imputation by means and multi-imputation: $N = 21{,}312$ (violent: 5162), missing: 528.
No imputation: $N = 12{,}033$ (violent: 2726), deleted because of missing values: 9279.

the religious values, it was worth trying to introduce the belief in a life after death into the analysis. Theoretically a counter-weight to deviant definitions, it turned out to have no protective effect. Delinquent friends and watching illegal hard-core videos scored as the heaviest risk factors. Being popular in high school proved to have a certain preventive effect against an undesirable development in young adulthood. Compared to the performance of the previous model, this socio-psychological model made considerably better predictions with only half as many variables. As differential association and learning heavily depend on local and historical circumstances such as the existence of ghettos, its validity cannot be evaluated solely on the basis of one single country or epoch.

7. The model for rational choice and lifestyle theories

For immediate reward by material profit or by an emotional gain, such as power or revenge, violence seems to be a rational means (Cornish & Clarke, 1986). Based on this premise, criminal choice depends mostly on the opportunity and the (perceived) necessity to commit crimes. Hindelang, Gottfredson, and Garofalo (1978) with the lifestyle model, and Cohen and Felson (1979) and Felson (2002) with the routine activity approach, have set the accent on the exposition to situations prone to create opportunities for crime or to increase the likelihood of victimization. Under certain circumstances the dynamics of retaliation and bullying can incite an individual to become violent when, otherwise, he would not. This approach justifies including frequent visits to public events and groups (such as sports events, disco and parties, extremist groups, etc.) as influences to be tested. The fact to have unpaid debts could also generate conflicts terminating in violence. Clarke (1997) in a more recent development has introduced the notion of so-called facilitators, that is accessories that contribute to the commission of crime (especially weapons).

Among all models derived from sociological theories, situational inducements (Table 4) offered the best prediction for violent behavior. Yet its performance relies heavily on weapons as facilitators of crime. After eliminating those variables, the percentage of hits drops to 14.1 vs. 11.5% (with vs. without imputing). Then again, a fondness for weapons could also be related to character traits, because not everybody wants to possess iron knuckles. Finally, we ran the model with variables only related to socializing (many friends, going to events a lot, having a sexual relationship) and not containing any choices of delinquent or risky environments and activities (such as weapons, prostitution, violent groups etc.). Those models, providing insights into the aspect of purely situational violence, had extremely low case sensitivities (4.2% vs. 3.3% with vs. without imputing) and extremely high rates of false positives (48.9% vs. 52.0% with vs. without imputing). Thus we found no empirical evidence for the claim that everybody can turn to violence as a consequence of pure exposure to many social situations (one of the sub-hypotheses of rational choice and lifestyle theories).

8. The model for control theory

Basic questions of control theory include why most people do not commit crime, why restraining personality traits are missing in delinquents and why the latter do not seem to react appropriately to social control (Gottfredson & Hirschi, 1990). According to the hypothesis of control theory it is the emotional attachment, which permits society to control its members with respect to crime. The social bond is first established in early childhood with the socialization in the family and later reinforced in school. Actually an abstract construct like the emotional bond is hard to measure with self-report data. We therefore resorted to several indicators for bonding that have proven their predictive force in former studies. The family and education approach was shaped among others by the research of the Glueck and Glueck (1950), covering a sample of 500 delinquent boys and a comparison group of the same size matched by age, intelligence, ethnicity, and residence in underprivileged neighborhoods. They distinguished five dimensions as main influences: guidance and supervision of the boy by mother and father respectively, warmth of the relationship with either parent and cohesion of the family. These dimensions were approximated and operationalized with composite variables from different items in the questionnaire. Some studies in criminology have confirmed the fact that an overly permissive education is more likely to produce delinquent and aggressive behavior than an excessively strict and punitive attitude of the parents (McCord & McCord, 1959; Nye, 1958). These authors concurred with the assumption that delinquency can be controlled when adolescents entertain reasonably good relationships with parents and teachers. Then again, social bonds can only be established if the parents communicate values and act themselves accordingly. So we added two items to account for a potential lack of moral conscience of the parents with the question: have you ever heard your parent make remarks like “as long as you don't get caught, it's not necessary to keep the rules”, or “all means are ok to achieve your goal”. Finally we tested school-related influences with this large model.

Of the Glueck factors in the control theory model (Table 5), the roles of father and mother were reproduced along the lines of traditional gender roles. Lack of warmth seems to be important in the relationship with

Please cite this article as: Haas, H., & Cusson, M., Comparing theories' performance in predicting violence, *International Journal of Law and Psychiatry* (2015), http://dx.doi.org/10.1016/j.ijlp.2015.01.010

Table 4
Rational choice and lifestyle theories (14 variables entered, 10 models with multi-imputation).

	OR	*OR*	*OR LCL–ULC*
Variables	Imp. means	No Imp.	Multi-Imp.
Had a steady girlfriend (partner) (in the past year)	1.128	1.126	1.090–1.177
Number of persons considered as friends	1.021	x	0.998–1.029
Went to many different parties, groups, events (all types, not only those known for violence)	1.107	1.156	1.108–1.161
Had many debts, financial difficulties (not counting scholarships)	1.044	1.049	1.020–1.054
Hung around a lot doing nothing	1.150	1.139	1.102–1.215
Episodes of visiting prostitutes in the past year	1.070	1.064	1.043–1.094
Episodes of getting paid for sex in the past year	1.038	x	0.984–1.055
Number of friends in trouble with the police	1.227	1.203	1.166–1.220
Possesses wooden weapons, baseball-bats for fighting	1.624	1.463	1.249–1.460
Possesses knifes longer than Swiss army knives	1.199	1.271	1.150–1.266
Possesses iron knuckles or iron bars for fighting	1.931	1.346	1.170–1.429
Possesses handguns	1.311	1.157	0.965–1.150
Possesses rifles	x	x	0.917–1.072
Episodes of carrying around those weapons	1.026	1.030	1.019–1.036
Classification parameters/prob level .5	Imp. means	No Imp.	Multi-Imp.
Correct predictions	78.6%	77.9%	77.6–77.8%
True hits (sensitivity)	24.6%	16.7%	19.2–20.0%
True rejections (specificity)	95.9%	97.5%	96.2–96.4%
False alarms (false positives)	34.4%	31.8%	36.4–37.9%
False rejections (false negatives)	20.1%	21.4%	21.0–21.1%

Legend: x = removed by the algorithm.
Imputation by means and multi-imputation: $N = 21{,}312$ (violent: 5162), missing: 528.
No imputation: $N = 14{,}477$ (violent: 2994), deleted because of missing values: 6835.

Table 5
Control theory (30 variables entered, 10 models with multi-imputation).

	OR	*OR*	*OR LCL–UCL*
Variables	Imp. means	No Imp.	Multi-Imp.
Early separation from mother during pre-school age (including mother's mental illness or death)	1.225	1.503	0.977–1.450
Lack of father's guidance during childhood	1.193	x	0.969–1.303
Lack of mother's guidance during childhood	x	x	0.974–1.240
Lack of father's warmth during childhood	x	x	0.988–1.288
Lack of mother's warmth during childhood	1.361	x	1.140–1.529
Lack of family cohesion during childhood	x	x	0.841–1.015
Lack of father's guidance during adolescence	x	x	0.959–1.248
Lack of mother's guidance during adolescence	x	x	0.961–1.187
Lack of father's warmth during adolescence	x	x	0.904–1.167
Lack of mother's warmth during adolescence	1.702	x	1.455–1.834
Lack of family cohesion during adolescence	1.111	x	1.015–1.159
Has moved from city to city a lot	1.030	1.040	1.005–1.054
Father's (or educators') lack of moral conscience	1.218	1.342	1.087–1.276
Mother's lack of moral conscience	1.180	x	1.052–1.281
Had good relations with teachers in grade school	0.935	x	0.889–0.975
Teachers ignored violent incidents in grade school	x	x	0.775–1.096
Teachers separated fighting kids in grade school	0.886	0.884	0.819–0.966
Violent kids were punished in grade school	x	x	0.850–1.003
Collective punishments for violence in grade school	x	x	0.721–1.163
Teachers discussed violent incidents in grade school	x	x	0.879–1.045
Had good relations with teachers in high school	0.777	0.745	0.751–0.824
Teachers ignored violent incidents in high school	1.284	1.322	1.141–1.464
Teachers separated fighting kids in high school	1.122	1.144	1.035–1.223
Violent kids were punished in high school	1.217	1.320	1.145–1.315
Collective punishments for violence in high school	1.308	x	1.076–1.581
Teachers discussed violent incidents in high school	1.089	1.144	1.017–1.171
Took actively part in a club, association or society	1.106	1.113	1.056–1.144
Smokes cigarettes	1.339	1.363	1.294–1.375
Moved to a bigger city after adolescence	x	x	0.912–1.125
Believes in life after death	x	x	0.980–1.054
Classification parameters/prob level .5	Imp. means	No Imp.	Multi-Imp.
Correct predictions	76.2%	76.1%	76.2–76.3%
True hits (sensitivity)	9.7%	3.5%	9.7–10.1%
True rejections (specificity)	97.4%	99.2%	97.4–97.5%
False alarms (false positives)	45.2%	40.3%	43.8–44.9%
False rejections (false negatives)	22.8%	23.7%	22.8–22.9%

Legend: x = removed by the algorithm.
Imputation by means and multi-imputation: $N = 21{,}312$ (violent: 5162), missing: 528.
No imputation: $N = 10{,}960$ (violent: 2383), deleted because of missing values: 10,352.

Please cite this article as: Haas, H., & Cusson, M., Comparing theories' performance in predicting violence, *International Journal of Law and Psychiatry* (2015), http://dx.doi.org/10.1016/j.ijlp.2015.01.010

the mother but not with the father, whereas with the influence of firm educational guidance it was the opposite. The role model aspect of their father–son relationship seems to be more important for boys than emotional closeness and the mother's educational guidance appears to count less in terms of violence prevention. Not surprisingly parents' deficits of moral conscience were retained as negative influences. Such mothers or fathers provide negative models for their children, but the effect can also be interpreted as a risk for violent or psychological abuse within the family, or for a lack of emotional bonds from the parents' side toward their children. A good relationship with the teacher was protective (cf. Scarpitti, Murray, Dinitz, & Reckless, 1960), especially during high school. Teachers' interventions against violence in grade school seem to have a protective effect against later violence. During adolescence though, all educational effort of parents and teachers to ignore, punish or discuss fighting among youngsters seem to be counterproductive. That raises the question of what can be the teachers' and the parents' role in the education of adolescents? We can only offer an educated guess from a clinical point of view: May be what counts is not so much what adults do, but who they are. In their quest to find an autonomous identity, adolescents seek and need respected adult figures inside and outside the family for positive role models in life.

Cigarette smoking, a delinquency predictor discovered by Hirschi (1969), was also found to be a risk.

The control theory model showed a disappointingly low case sensitivity. While predicting the peacefulness of well-bonded boys, it cannot predict the outcome of educational failures. Then again, this result suits the theory's premise to focus primarily on the origins of non-delinquent behavior, which it predicted well. Furthermore the absence of a warm relationship with the mother, as well as an early separation from her, belonged to the most influential factors and are both pointing to a potential lack of emotional bonds, supporting thus one of the basic hypotheses of control theory. On the other hand causes of severe juvenile violence might not only be related to a failure of bonding, but also to neuropsychological dysfunctions (e.g. attention deficit and hyperactivity and other neuro-psychological impairments), which do not improve with love or punishment only. Finally, one should consider the consequences of a lack of bonding on a wider scale than just violence, for example causing covert forms of aggression (stealing, lying, drug addiction, etc.).

9. The model for childhood trauma theories

Most studies in the field of trauma theory demonstrate a significant association between childhood maltreatment and subsequent delinquency (e.g. Alfaro, 1981). The strength and patterns of this correlation vary according to gender, race and ethnicity, socioeconomic status, type of maltreatment, and type of delinquency. The trauma-specific submodel (Table 6) retained all forms of child-abuse, alcoholism of the parents as well as the boy's (life-time) accidents.

While the absence of trauma seems to be protective, the parameters show that trauma alone cannot be the cause of violence. It is worth noting that the hypothesized cycle of violence does not exist in absolute terms. More than half (54.8%) of the severely beaten boys (i.e. 4.8% of all recruits) did not commit any act of physical violence during the year preceding recruits' training while almost half of all violent young men (48.4%) had never been beaten by their parents. Then again, our model says nothing about other undesirable outcomes (covert aggression, psychiatric disorders, etc.) after childhood trauma.

However sexual trauma in boys does have a distinct impact on later violence. Childhood victimization by sexual abuse is also the major predictor for later sexual offenses committed by young males (cf. Haas, 2001, pp. 219ss; pp. 335ss). If the trauma model is a poor predictor of violence, this leads to another research question: What distinguishes resilient children who were exposed to trauma from those who are not resilient? Good relations with parents scored as an important protective factor for all cases. We then tried to introduce more variables related to resources and to coping after the experience of sexual or violent victimization (like receiving good care, feeling helpless, being afraid, thinking of revenge, forgetting about the incident, etc.). While some of these variables were retained as risks (revenge) or protective (being afraid), they did not improve the overall performance of the model.

10. The psychopathology model

Diagnostic classification systems (ICD-10 and DSM-IV) in psychiatry are based on an international consensus between experts of different schools. Psychopathology asserts that lack of parental care, biological predispositions and trauma can all be causal for a disturbed development. Many studies in psychopathology (e.g. Raine, 2013) have shown

Table 6
Trauma theories (14 variables entered, 10 models with multi-imputation).

Variables	*OR* Imp. means	*OR* No Imp.	*OR LCL–UCL* Multi-Imp.
Early separation from mother during pre-school age (including mother's mental illness or death)	x	x	0.970–1.438
Number of accidents suffered during childhood and adolescence	1.065	1.073	1.053–1.072
Sexual abuse or exploitation during childhood (by any perpetrator)	1.401	1.343	1.228–1.460
Beatings by the parents during childhood	1.114	1.175	1.048–1.201
Sexual abuse or exploitation during adolescence (by any perpetrator)	1.572	1.494	1.370–1.615
Beatings by the parents during adolescence	1.556	1.561	1.348–1.592
Father's spousal violence against the mother (episodes)	x	x	0.970–1.008
Mother's spousal violence against the father (episodes)	x	x	0.973–1.044
Episodes of father's excessive drinking	1.010	1.008	1.002–1.013
Episodes of mother's excessive drinking	1.014	1.018	1.000–1.021
Could talk about anything with his mother during childhood	0.650	0.784	0.582–0.756
Could talk about anything with his father during childhood	x	x	0.868–1.157
Could talk about anything with his mother during adolescence	0.692	x	0.618–0.791
Could talk about anything with his father during adolescence	0.867	x	0.776–0.947
Classification parameters/prob level .5	Imp. means	No Imp.	Multi-Imp.
Correct predictions	76.3%	76.2%	76.4–76.6%
True hits (sensitivity)	10.6%	5.5%	9.8–10.6%
True rejections (specificity)	97.3%	98.7%	97.6–97.8%
False alarms (false positives)	44.4%	41.7%	40.8–42.2%
False rejections (false negatives)	22.7%	23.4%	22.6–22.8%

Legend: x = removed by the algorithm.
Imputation by means and multi-imputation: $N = 21{,}312$ (violent: 5162), missing: 528.
No imputation: $N = 16{,}265$ (violent: 3441), deleted due to missing values: 5047.

Please cite this article as: Haas, H., & Cusson, M., Comparing theories' performance in predicting violence, *International Journal of Law and Psychiatry* (2015), http://dx.doi.org/10.1016/j.ijlp.2015.01.010

that mother's malnourishment, stress by spousal violence during pregnancy, as well as abuse and neglect significantly affect brain development. Boys seem to be more vulnerable than girls in this respect.

Epidemiological research in mental health has confirmed the validity of anonymous questionnaires in recording psychiatric symptoms. One part of the symptoms refers to childhood and adolescence. Obviously, biological and neurological influences on violence cannot be tested by self-report data. Still, some correlates of disturbed neurological development are accounted for by the items of childhood accidents and of problems with concentration and nervousness (ADHD). Boys who have many accidents can be affected by neurological impairments in the first place, which increase their risk of having accidents, such as poor motor coordination and attention deficit or hyperactivity disorder. Or else accidents provoking traumatic brain injury can lead to an impaired development or an altered personality. In any case psychopathology argues that violence is not directly caused by childhood risks, but by a variety of traits in some individuals who, for various reasons, could not cope with risks or could not develop normally even under ordinary circumstances. To estimate developmental disturbances, a working definition of severe conduct disorder was based on items similar to the criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV, American Psychiatric Association, 1994). This syndrome includes a strong tendency toward delinquency and violent behavior and is not to be confused with minor disciplinary problems. For the operationalization of conduct disorder during childhood or adolescence almost all criteria of the DSM-IV were used and not just those referring to violence. For 10.37% of all recruits there were sufficient indicators for the presence of a severe conduct disorder during their youth. The onset manifested itself in most cases in childhood. The presence of severe juvenile conduct disorder was also the best single predictor of later violence, a result that many researchers have observed before ($OR = 6.67$ or 59.5% of the affected boys will use violence as young adults).

In order to measure signs of personality disorder at young adult age as compared to delinquency, we obviously had to avoid tautological definitions. Therefore we chose the relevant symptoms according to the concept of Rauchfleisch (1981), which is close to the dissocial PD of ICD-10 (World Health Organization, 2010) but does not contain any delinquent acts as criteria and is more readily operationalized with self-reported data. For example, defective moral conscience was measured by the presence of different cognitive distortions such as finding violence a justified means to achieve one's goals, or finding it acceptable to break the law as long as one does not get caught. Taking into account psychopathology we also added indicators for addictions and substance abuse (definitions see Haas, 2001, pp. 123ss).

The algorithm of the psychopathology model (Table 7) retained deficient moral conscience, cognitive distortions, difficulties to master aggressive drives, alcohol, heroin and cocaine abuse, gambling and suicide attempts. It excluded abuse of cannabis and designer drugs, as well as feelings of depression and hanging around (i.e. boredom). As a protective influence the capacity to maintain friendships with non-delinquents peers was retained. Some might suspect that the performance of the model be due to the influence of juvenile conduct disorder, because it is the best single predictor of future violence. However, taking it out of the list of entering variables produced a psychopathology model only slightly less precise (27.1 vs. 24.8% true hits with vs. without imputing). Thus the psychopathology model comes closest the complete interdisciplinary model. Having the highest sensitivity, this model also has the lowest false positive rate of all theories. Contrary to what some of its critics say, psychopathology is therefore less stigmatizing than other theories of violence.

The psychopathology model also fulfills Kroner, Mills, and Reddon's (2005) requirements mentioned at the beginning of this study: It is theory driven and it provides specific, measurable goals for offender rehabilitation, such as treating symptoms like attention deficit disorder and hyperactivity, impulsive acting-out, cognitive distortions, and addictions.

11. Comparison with the best available theory unspecific model

Finally one would like to know the prediction power of the best interdisciplinary model, constructed with all ninety-two available variables, compared to the null hypothesis.

Table 7
Psychopathology (16 variables entered, 10 models with multi-imputation).

Variables	*OR* Imp. means	*OR* No Imp.	*OR LCL–UCL* Multi-Imp.
Number of accidents suffered during childhood and adolescence	1.033	1.030	1.020–1.040
Problems with concentration and nervousness during childhood	x	x	0.865–1.055
Problems with concentration and nervousness during adolescence	x	1.112	0.982–1.183
Presence of juvenile conduct disorder DSM-IV (for the severe condition the OR is raised to power 2)	1.594	1.605	1.519–1.695
Capacity to sustain good relationships (number of non-delinquent friends at young adult age)	0.969	0.977	0.956–0.985
Feelings of worthlessness and depression	x	x	0.973–1.045
Hung around a lot doing nothing (boredom)	x	x	0.945–1.051
Deficient moral conscience, justifying delinquency	1.174	1.216	1.147–1.218
Cognitive distortions, prejudice, projections	1.074	1.088	1.054–1.093
Difficulties to master aggressive and sexual impulses (episodes of insulting people, sexual risks taken)	1.064	1.065	1.055–1.064
Suicide attempt(s) over life-time	1.708	1.352	1.302–1.988
Episodes of gambling at slot machines	1.273	1.243	1.187–1.309
Episodes of cannabis abuse in the past year	x	x	0.994–1.003
Episodes of abuse of synthetic drugs in the past year	x	x	0.992–1.015
Episodes of alcohol abuse in the past year	1.032	1.023	1.018–1.033
Episodes of heroine, cocaine or crack abuse in the past year	1.023	x	0.999–1.034
Classification parameters/prob level .5	Imp. means	No Imp.	Multi-Imp.
Correct predictions	79.3%	79.4%	79.3–79.4%
True hits (sensitivity)	29.4%	27.2%	28.8–29.1%
True rejections (specificity)	95.2%	96.0%	95.4%
False alarms (false positives)	33.9%	31.3%	33.0–33.1%
False rejections (false negatives)	19.2%	19.5%	19.2–19.3%

Legend: x = removed by the algorithm.
Imputation by means and multi-imputation: $N = 21{,}312$ (violent: 5162), missing: 528.
No imputation: $N = 18{,}979$ (violent: 4219), deleted due to missing values: 2333.

Please cite this article as: Haas, H., & Cusson, M., Comparing theories' performance in predicting violence, *International Journal of Law and Psychiatry* (2015), http://dx.doi.org/10.1016/j.ijlp.2015.01.010

Table 8
The interdisciplinary multivariate regression model of violence (92 variables entered, 10 models with multi-imputation).

Classification parameters/prob level .5	Imp. means	No Imp.	Multi-Imp.
Correct predictions	80.6%	79.7%	79.9–80.1%
True hits (sensitivity)	36.3%	28.8%	33.2–34.0%
True rejections (specificity)	94.7%	95.9%	94.8–94.9%
False alarms (false positives)	31.3%	30.8%	32.1–32.8%
False rejections (false negatives)	17.7%	19.2%	18.2–18.4%
Factors retained in the models	35 factors	17 factors	32–39 factors

Imputation by means and multi-imputation: $N = 21{,}312$ (violent: 5162), missing: 528.
No imputation: $N = 4429$ (violent: 929), deleted due to missing values: 16,883.

By retaining the previously successful predictors and dropping the others, the best interdisciplinary regression model (Table 8) based on the insertion of all entering variables, confirmed all trends seen in the performance of single-theory models. Again some of the classical sociological variables like immigration, parents' dependence on welfare, the family's often moving around and the recruit's being unemployed were shown as subordinate to the others by being completely eliminated by the algorithm. The number of delinquent friends, episodes of watching illegal porn and splatter videos, frequentation of many violent groups and events as well as the possession of illegal weapons also played an important role in the interdisciplinary model, confirming associative learning and rational choice theories. Almost all variables related to psychopathology were retained (dissocial personality traits, addictions). Furthermore the same variables related to good relationships with family and teachers and also those related to victimization and trauma were retained.

A word of caution must be said to avoid an inductive fallacy when generalizing the above-mentioned results. To put it like this, "delinquent activity is at the same time wide-spread and concentrated. Widespread: the majority of adolescents will occasionally indulge in minor delinquent activities. (…) However, in another way, wherever it was measured, delinquency was concentrated on a minority youths with such a frequent delinquent activity that they are finally responsible for an important part of crime" (Cusson, 1998, p. 83, see also in 2003, 2005, 2006). Consequently, analyzing different levels of violence revealed that they are not caused by the same factors. When young men committed milder forms of violence (i.e. not using weapons, not frequently and not causing serious injury) those forms are more prone to be influenced by situational circumstances. Severe and frequent violent offending—on the other hand—seems to be even more closely connected to the psychopathology of the perpetrators (see Haas, 2001).

12. Discussion

While comparison may offer some clues to the relevance of theories, definite conclusions can be drawn only after confirmation or modification by other cross-sectional interdisciplinary studies. Yet some inferences can be drawn from the present results: First of all by selecting variables one can prove almost anything in social sciences. In the absence of a direct comparison with other models, some theory models are apt to maintain an unsupported credibility. Cressey stated in 1962 (in: Wolfgang, Savitz, & Johnston) that there is a necessity for integrated research going beyond ideological debate in criminology. The following influences have demonstrated their impact on violence under multivariate analysis: psychopathological symptoms, emotional bonds, crime facilitators and group association. By using current possibilities of data collection and -analysis and discussing the results in the light of different methods many old controversies could be resolved by providing deeper explanations. In our opinion, the future lies clearly in bio-psycho-social models such as the one proposed recently by Steinert and Whittington (2013).

As it happens, the comparison of theory performance demonstrates that many theories in social and medical science are complementary and not really contradictory. Contradictions often seem to arise from turf wars and not from the data. Each single theory that we operationalized was quite good at predicting non-violence (95.0% to 99%), but none of them could recognize more than thirty percent of the violent cases. The interdisciplinary model however did raise the prediction of true hits considerably to 36% compared to the theory driven models. Its advantage lies in the latent influences that it contains. For example, considering early trauma effects as predictors, we can assume that the differential association and learning model and the control theory model both contain latent variables of good coping with trauma through building strong relationships and of bad coping by selecting bad company. Thus it seems that mixing risk and protecting factors from previous research in different disciplines into one single prediction scale can produce an increase in predictive power and must not necessarily be a disadvantage, contrary to the concerns of Kroner et al. (2005). Then again being clinicians too, we find the proposals made by those researchers well founded and reasonable for best clinical practice. For example, their proposals (2005) and our results made us think of the possibility of creating special prediction scales measuring desistance against recidivism with some of the items typical for those theories that performed better in the prediction of non-violent outcomes.

Finally we are conscious of the fact that not even ninety-two variables of an epidemiological study can cover all the complex interactions of primary and secondary influences on a phenomenon like violence. Considering that every research method only provides part of the whole picture, all results obtained by one approach need to be discussed in the light of the results of complementary research methods.

Epidemiological studies (longitudinal and cross-sectional) on the one hand confirm many results from clinical studies. For example (Haas, 2001, p. 237ss) the personality profiles of severely violent offenders among the recruits' closely resembled those known from clinical studies. Clinical studies on the other hand provide more insight into specific biographies, social circumstances, and biological and neuropsychological parameters leading to certain outcomes and offer new clues about influences and methods needing to be considered in future epidemiological studies.

At a first glance it may appear to be somewhat disappointing for empiricists and practitioners in legal psychiatry and psychology to see that no multivariate model is able to predict a majority of violent cases and that they produce as many false alarms as hits. Then again human behavior is certainly influenced by circumstantial, social, medical and biographical factors, but it is not doomed. We suspect that unexplained part of the variance, appearing in all prediction scales, has a systematic significance: it might stem from the individual free will. Incidentally Baumeister, Masicampo, and DeWall (2009) showed that the belief in this human potential—too often neglected in the violence prediction debate—has a positive effect on pro-social and non-aggressive behavior. In our opinion it is important for offender rehabilitation that the unexplained rest of variance in violence prediction be also interpreted on this conceptual basis.

Acknowledgments

The authors wish to express their thanks to Marianne Pithon for her close reading of our manuscript and also to Martin Killias, who has initiated the 1997 recruits' study.

References

Akers, R.L. (1985). *Deviant behavior: A social learning approach.* Belmont, CA: Wadsworth.
Akers, R.L. (1994). *Criminological theories: Introduction and evaluation.* Los Angeles, CA: Roxbury Publishing.
Alfaro, J.D. (1981). Report on the relationship between child abuse and neglect and later socially deviant behavior. In R.J. Hunner, & Y.E. Walker (Eds.), *Exploring the relationship between child abuse and delinquency* (pp. 175–219). Totowa, NJ: Allanheld, Osmun & Co.
American Psychiatric Association (1994). *Diagnostic and statistical manual of mental disorders DSM-IV (4th Ed.), Washington DC.*

Please cite this article as: Haas, H., & Cusson, M., Comparing theories' performance in predicting violence, *International Journal of Law and Psychiatry* (2015), http://dx.doi.org/10.1016/j.ijlp.2015.01.010

Becker, H. (1963). *Outsiders: Studies in the sociology of deviance.* New York, NY: Free Press.
Baumeister, R.F., Masicampo, E.J., & DeWall, C.N. (2009). Prosocial benefits of feeling free: Disbelief in free will increases aggression and reduces helpfulness. *Personality and Social Psychology Bulletin*, *35*, 260–286. http://dx.doi.org/10.1177/0146167208327217.
Clark, R. V. (1997). Situational crime prevention: Successful case studies. In R.V. Clarke (Ed.), (2nd ed.). Albany, NY: Harrow & Heston.
Cohen, L.E., & Felson, M. (1979). Social change and crime rate trends: A routine activity approach. *American Sociological Review*, *44*, 588–608.
Cornish, D., & Clarke, R.V. (Eds.). (1986). *The reasoning criminal.* New York, NY: Springer.
Cressey, D.R. (1962). The development of a theory: Differential association. In M.E. Wolfgang, L. Savitz, & N. Johnston (Eds.), *The sociology of crime and delinquency* (pp. 81–90). New York, NY: John Wiley & Sons.
Cusson, M. (1998). *Criminologie actuelle [Contemporary criminology].* Paris, France: Presses universitaires de France.
Cusson, M. (2003). La criminologie développementale et la criminologie situationnelle: des théories complémentaires [Developmental criminology and the situational approach: Complementary theories]. *Annales Internationales de Criminologie*, *41*, 191–202.
Cusson, M. M. (2005). *La criminologie. Quatrième édition revue et corrigée [Criminology]* (4th ed. rev. & corr.). Paris, France: Hachette.
Cusson, M. (2006). La délinquance, une vie choisie [Delinquency, a chosen lifestyle]. *Revue internationale de criminologie et de police technique et scientifique*, *2*, 131–148.
Felson, M. (2002). *Crime and everyday life.* Thousand Oaks, CA: Sage Publications.
Glueck, S., & Glueck, E. (1950). *Unraveling juvenile delinquency.* Cambridge, MA: Harvard University Press.
Gottfredson, M., & Hirschi, T. (1990). *A general theory of crime.* Stanford, CA: Stanford University Press.
Haas, H. (1997). *Expériences de vie et comportements. Questionnaire complémentaire des Enquêtes fédérales auprès de la jeunesse et des recrues (ch-x) [Life experience and behavior. Complementary questionnaire of the Swiss Federal Surveys of Adolescents and Recruits (ch-x)].* Berne, Switzerland: Bundesamt für Bauten und Logistik.
Haas, H. (2001). *Agressions et victimisation: une enquête sur les délinquants violents et sexuels non détectés [Violence and victimisation: A study of undetected sexual and violent offenders].* Aarau, Switzerland: Sauerländer Verlag.
Hindelang, M.J., Gottfredson, M.R., & Garofalo, J. (1978). *Victims of personal crime: An empirical foundation for a theory of personal victimization.* Cambridge, MA: Ballinger Publishing Company.
Hindelang, M.J., Hirschi, T., & Weis, J. (1981). *Measuring delinquency.* London, England: Sage Publications.
Hirschi, T. (1969). *Causes of delinquency.* Berkeley, CA: University of California Press.
Killias, M. (1997). *Expériences de vie et comportements. Questionnaire des Enquêtes fédérales auprès de la jeunesse et des recrues (ch-x) [Life experience and behavior. Questionnaire of the Swiss Federal Surveys of Adolescents and Recruits (ch-x)].* Berne, Switzerland: Bundesamt für Bauten und Logistik.
Kroner, D., Mills, J., & Reddon, J. (2005). A coffee can, factor analysis, and prediction of antisocial behavior: The structure of criminal risk. *International Journal of Law and Psychiatry*, *28*, 360–374. http://dx.doi.org/10.1016/j.ijlp.2004.01.011.
Lemert, E. (1967). *Human deviance, social problems, and social control.* Englewood Cliffs, NJ: Prentice-Hall.
Lessler, J., & Kalsbeek, W. (1992). *Nonsampling error in surveys.* New York, NY: John Wiley & Sons.
Marx, K. (1867). *Das kapital.* Hamburg, Germany: Verlag Otto M. Eissner.
McCord, W., & McCord, J. (1959). *Origins of crime: A new evaluation of the Cambridge–Somerville study.* New York, NY: Columbia University Press.
Merton, R.K. (1938). Social structure and anomie. *American Sociological Review*, *3*, 672–682.
Merton, R.K. (1968). *Social theory and social structure.* New York, NY: Free Press.
Nye, R.I. (1958). *Family relations and delinquent behavior.* New York, NY: John Wiley & Sons.
Quinney, R. (1977). *Class, state, and crime.* New York, NY: David McKay.
Raine, A. (2013). *The anatomy of violence: The biological roots of crime.* New York, NY: Random House.
Rauchfleisch, U. (1981). *Dissozial.* Goettingen, Germany: Vandenhoeck & Ruprecht.
Scarpitti, F.R., Murray, E., Dinitz, S., & Reckless, W.C. (1960). The good boy in a high delinquency area. Four years later. *American Sociological Review*, *23*, 555–558.
Sellin, T. (1938). *Culture conflict and crime.* New York, NY: Social Science Research Counsel.
Steinert, T., & Whittington, R. (2013). A bio-psycho-social model of violence related to mental health problems. *International Journal of Law and Psychiatry*, *36*, 168–175. http://dx.doi.org/10.1016/j.ijlp.2013.01.009.
Sutherland, E.H., & Cressey, J.B. (1955). *Principles of criminology* (5th ed.). Philadelphia, PA: J. B. Lippincott.
Swiss National Science Foundation (1995). Violence in daily life and organized crime. Implementation plan of the National Research Programme 40. In M. Pieth, F. Alsaker, M. von Cranach, C. Del Ponte, C. Hanetseder, K. -L. Kunz, F. Messant, & P. Müller (Eds.), (Berne, Switzerland.).
World Health Organization (2010). *International classification of mental and behavioural disorders* (10th ed.) Geneva, Switzerland

Please cite this article as: Haas, H., & Cusson, M., Comparing theories' performance in predicting violence, *International Journal of Law and Psychiatry* (2015), http://dx.doi.org/10.1016/j.ijlp.2015.01.010